

# SPECIFICATION

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## METHOD AND SYSTEM TO AUTOMATICALLY ACTIVATE SOFTWARE OPTIONS UPON INITIALIZATION OF A DEVICE

### Background of Invention

- [0001] The present invention relates generally to a method and system for enabling software, and more particularly, to remotely activating upon a device initialization inactive software options resident in memory of the device.
- [0002] Information exchange between a centralized facility and remote medical diagnostic devices and supporting systems, such as medical imaging systems, has steadily improved in recent years. Examples of systems capable of exchanging information remotely include magnetic resonant imaging (MRI) systems, computed tomography (CT) systems, ultrasound and x-ray systems, and positron emission tomography (PET) systems. Typically, these systems are factory configured having multiple options that may or may not be utilized by a customer or user. Some known systems permit a user to configure a device according to the user's needs, but these systems require the user to determine and, often, guess as to what features will be needed in the future. To further complicate matters, users owning multiple devices often desire to network the devices even though activated options on the devices may vary.
- [0003] Known systems attempt to sense on-going customer needs by arranging for a service technician to physically travel to the location of the device, install and enable the option, and in some cases, calibrate the device to ensure proper operation. Since service calls are normally conducted during device operation

periods, the service calls result in unnecessary delay and device down time while installation of the new software application on the device is completed. Further, the user is limited as to when installation of a key to enable the option can occur. Even if demand for usage of the device having the selected options for enablement peaks around the date of the service call, it is generally not economical or efficient for a user to reschedule the service call. Rescheduling may deny access to options desired to be activated for an extended period of time. Additionally, a user may be charged fees associated with the cancellation and rescheduling of the service call.

[0004] Further advancements provide remote service to medical diagnostic systems in an effort to allow a level of service on a continual and interactive basis as needed by many facilities. In one such system, a facility can interactively receive messages via a network and can respond automatically to the messages if configured correctly. Data required to analyze a state of operation of the medical diagnostic device can be transferred and immediately stored for use during an electronic connection. This technique greatly facilitates identification of system problems, allows questions to be posed to the centralized facility, facilitates rapid transfer of updates and imaging protocols, and permits standard and customized reports to be automatically transmitted to subscribing systems or facilities without further user input or acceptance. The non-user interactive aspect of this technique allows the medical diagnostic facility to remain current on services provided by the centralized facility and to readily communicate with the facility.

[0005] Often, healthcare or other facilities desire to minimize initial purchase price expenditures by limiting the number of options that are activated. Later, as demand for inactive options increases, a facility may request activation of an option by sending a request to a centralized facility. After authentication of the request, it is then processed. Current solutions for processing the request include automatic direct downloading and installing of a software application to the device upon user selection of the option desired to be activated, or manual electronic transfers during service calls. These processes immediately install the software application in the device, independent and regardless of device operation status.

[0006] While such solutions and the provision of remote services to medical diagnostic devices have greatly enhanced the level of service and data exchange, it is not always desirable to immediately permit data exchange, especially installation of a software code while a device is in operation, such as when a medical imaging device is conducting an imaging scan. Furthermore, although advancements in data exchange have provided for automatic data transfers between a centralized facility and remotely located devices, they have not been able to ensure that installation is prevented during an active imaging session. Therefore, there is a need for providing a system and method of delaying activation of inactive options resident in memory of a device while the device is active or in use.

[0007] It would therefore be desirable to design a method and system to automatically activate options resident in memory of a device upon reboot of the device, thereby preventing automatic installation of options during device operation.

## Summary of Invention

[0008] The present invention is directed to a system and method to activate software options in a device upon initialization of the device located remotely from a centralized facility for a selected time period after the centralized facility transmits an enabling key to the device sometime prior to a present initialization of the device to overcome the aforementioned problems.

[0009] The present invention includes hardware and software to enable, upon reboot of a device, such as a medical imaging scanner, inactive software applications stored in memory of the device. The device comprises a computerized network, a receiving center connected to the computerized network, and a processing station located within the receiving center and having one or more processors. The computerized network connects the receiving center to the device through an external communication network, such as the Internet, direct dial-up links, an intranet, or a wireless platform. The computerized network is designed such that the processors of the processing station are configured to receive a request from a user for activation of an inactive software application resident on the device. After receipt of the request, the one or more processors generate an electronic enabler

configured to activate the software application. The processors then transmit the electronic enabler from the receiving center to the device. Transmission of the enabler can occur by email, direct download through the external communications network, transmission over a public or private communication line, or any other viable transmission means. The device further includes a processor which is programmed to control access to the inactive software application and verify transmission of the electronic enabler. If the electronic enabler is transmitted, the processor of the device determines a device operation status as active or inactive according to device operation at the time of receipt of the transmission. If the status is determined as active, the processor of the device prohibits activation and enablement of the software application until device initialization or reboot. If, however, the status is an inactive status, then the device processor automatically activates and enables the software application with device reboot. Alternatively, user authorization can be required prior to activation and enablement of the software application.

[0010] In accordance with the process of the present invention, a method to enable software options is disclosed that includes receiving an electronic request for activation of an inactive option in memory of a device located remotely from a centralized facility. The method further determines whether to activate the inactive option in response to the electronic request based on whether a set of criteria has been satisfied. The criteria is defined at the centralized facility and can include a number of parameters, including a user identifier, a system identifier, a host identifier, an option identifier, modality, and a period-of-use identifier. If the set of criteria is unsatisfied, use of the inactive option is denied. If the set of criteria is satisfied, the method generates an activation key configured to permit use of the inactive option upon installation of the key in the device, and further sends the activation key from the centralized facility to the device, wherein the activation key is automatically installed upon initialization of the device.

[0011] In accordance with another aspect of the present invention, a computer data signal embodied in a carrier wave and representing a set of instructions which, when executed by a processor, will cause the processor to review, at a centralized

facility, a request from a user to activate a software application stored in memory of a device located remotely from the centralized facility. The processor of the centralized facility determines whether a user is qualified, and if so, generates a software script designed to enable the software application. The processor then transmits the software script from the centralized facility to the device thereby enabling the software application, but only upon reboot of the device.

[0012] In accordance with yet another aspect of the invention, a software enabling system is disclosed comprising a device remotely located from a centralized facility and configured to receive transmissions from the centralized facility, wherein the device includes one or more inactive applications resident in memory and a computer to control the one or more inactive applications. The system further includes a data script creator, wherein the creator is designed to generate a data script configured to enable a user selected inactive application. The data script is further configured to automatically enable the selected inactive application upon initialization, or reboot, of the device. Preferably, the data script is specific to one or more of a system identifier, an application identifier, a period-of-use identifier, and a host identifier.

[0013] Various other features, objects and advantages of the present invention will be made apparent from the following detailed description and the drawings.

## **Brief Description of Drawings**

[0014] The drawings illustrate one preferred embodiment presently contemplated for carrying out the invention.

[0015] In the drawings:

[0016] Fig. 1 is a block diagram of a system for which the present invention is implemented therein.

[0017] Fig. 2 is a flow chart showing a process of the present invention and implemented in the system of Fig. 1.

## **Detailed Description**

[0018] Referring to Fig. 1, an overview block diagram of a medical diagnostic and service networked system 10 is shown which includes a plurality of remote user or customer stations, such as Customer A referenced with numeral 12, and Customer B referenced with numeral 14. It is understood, that the number of user stations can be limitless, but two specific embodiments are shown with Customer A and Customer B, which will be further explained hereinafter. The user stations 12, 14 are connected to a receiving center or centralized facility 16 through a communications link, such as a network of interconnected server nodes 18 or a remote link 20. Although a single centralized facility is shown and described, it is understood that the present invention contemplates the use of multiple centralized facilities, each capable of communication with each user station. Each user station has operational software associated therewith which can be configured, serviced, maintained, upgraded, monitored, enabled or disabled by the centralized facility 16.

[0019] The various systems disclosed are configured to be selectively linked to the centralized facility 16 by either the remote link 20, or in the example of user station 12, a laptop computer 22 connected to an internal network 24 of Customer A. Such selective linking is desirable to provide upgrades, maintenance, service, and general monitoring of the various systems and equipment at a customer site, which includes accessing data from the systems and transmitting data to the systems, for example.

[0020] In general, a customer site may have a number of devices such as a variety of medical diagnostic systems of various modalities. As another example, in the present embodiment, the devices may include a number of networked medical image scanners 26 connected to an internal network 24 served by a single scanner 28 having a workstation configured to also act as a server, or configured as a stand-alone server without a medical image scanner associated therewith. Alternately, a user station, or customer site 14 can include a number of non-networked medical image scanners 30, 32, and 34 each having a computer or work station associated therewith and having an internal modem 36, 38, and 40 to connect the remote user station to a communications link, such as the Internet 18

through links 37, 39, and 41, respectively, to communicate with the centralized facility 16. Internet 18 is shown in phantom to indicate that an external communications network can include Internet 18, together with communication links 29, 37, 39, and 41, or alternatively, can include direct dial-up links through dedicated lines, an intranet, or public communications systems.

[0021] It is understood that each of the network scanners 26 has its own workstation for individual operation and are linked together by the internal network 24 so that the user can have a centralized management system for each of the scanners. Further, such a system is provided with communications components allowing it to send and receive data over a communications link 29. Similarly, for the non-networked medical image scanners at remote user station 14, each of the scanners 30, 32, and 34 have individual communications links 37, 39, and 41. Although Fig. 1 shows each of these links connected through an open network 18, these links can permit data to be transferred to and from the systems over a dedicated network as well.

[0022] The embodiment shown in Fig. 1 contemplates a medical facility having such systems as magnetic resonance imaging (MRI) systems, ultrasound systems, x-ray systems, computed tomography (CT) systems, nuclear systems, cardiology systems, positron emission tomography (PET) systems, or any other type of medical imaging system, however, the present invention is not so limited. Such facilities may also provide services to centralized medical diagnostic management systems, picture archiving and communications systems (PACS), teleradiology systems, etc. Such systems can be either stationary and located in a fixed place and available by a known network address, or be mobile having various network addresses varying for different geographic or physical locations of the device. In the embodiment shown in Fig. 1, each user station 12, 14 can include any combination of the aforementioned systems, or a user station may have all of a single type of system. A user station can also include a single medical image scanner. Mobile diagnostic systems can be configured similarly to that of user station 12 or user station 14. Such mobile diagnostic systems can include equipment of various modalities, such as MRI, CT, ultrasound, or x-ray systems

and are mobilized in order to service patients at various medical facilities.

[0023] A request for access to and enablement of software options or applications of the present invention can be initiated by authorized personnel, such as an on-line engineer or technician, or a customer administrative personnel from a computer or workstation 42 in the remote link 20, which can be a part of the centralized facility 16, or be separately connected to the centralized facility 16 by a dialup link 44 to a web server 46 in the centralized facility 16. Alternatively, it is contemplated that the system could be initialized by a laptop computer 22 connected to a customer internal network 24, or individually connected to each of the scanners 30, 32, or 34. The remote link 20 can also serve to connect the centralized facility 16 to a user station by a telephone and telephone connection 48 through a conventional telephone network 50 and to an interactive voice recognition system (IVR) 52 in the centralized facility 16. The centralized facility 16 includes a number of processing systems including computers for the IVR system 52, an automated support center 54, the web server 46, and an auto checkout server 56, for processing customer and product data and creating an appropriate configuration file. Other processor systems include computers to maintain a voicemail system 58, a pager system 60, an email system 62, and a main frame 64, and more generally, an output report generator and notifier. Each is connectable and can transmit data through a network, such as an Ethernet 66 with one another, and/or with at least one database 68. However, it is understood that the single representation of a database in Fig. 1 is for demonstrative purposes only, and it is assumed that there is a need for multiple databases in such a system. It is also understood that the IVR system is not only a voice recognition system, but can also process interactive keypad entry from a touchtone telephone 48. A bank of modems 70 is connected to the Ethernet 66 to relay data from the centralized facility 16 to the remote user stations 12, 14 through a plurality of modem links 72.

[0024] As previously discussed, each of the systems and substations described herein and referenced in Fig. 1 may be linked selectively to the centralized facility 16 via a network 18. According to the present invention, any acceptable network may be employed whether public, open, dedicated, private, or so forth. The



communications links to the network may be of any acceptable type, including conventional telephone lines, fiber optics, cable modem links, digital subscriber lines, wireless data transfer systems, or the like. Each of the systems is provided with communications interface hardware and software of generally known design, permitting them to establish network links and exchange data with the centralized facility 16. The systems are provided with interactive software so as to configure the systems and exchange data between the user stations and the centralized facility 16. In some cases, during periods when no data is exchanged between the user stations and the centralized facility, the network connection can be terminated. In other cases, the network connection is maintained continuously.

[0025] The present invention includes a method and system for granting use of resident software options in a remotely located device. As previously indicated, the device, including medical imaging equipment, includes installed software that controls options or device capabilities that are typically enabled or disabled manually by a field engineer on-site in response to a request for use of the options from a qualified customer or user. The present invention, however, is directed toward a method and system to enable use of an inactive option upon device reboot or initialization. Enablement can be automatic or upon user authorization.

[0026] From a centralized facility, and after appropriate authentication of the user and validation of the system identification and user's status, an electronic enabler or activation key is generated in the centralized facility 16 and electronically transmitted to a device via the communication links 29, 37, 39, 41, and/or 72, Fig. 1, preferably over a private communication link, but other public communications systems can work equally well, such as direct dial-up Internet, or wireless communications. As previously set forth, it is understood that external communications links include a closed intranet system, an open public communications system, or a combination thereof.

[0027] Referring to Fig. 2, once the method and/or computer program is initiated 100, customer or user identification is input electronically by a user or an authorized field engineer, at a remote customer station or remote link, and received at the

centralized facility 102. The centralized facility then validates the user identification at 104. Validation of the user identification is determined according to a user identifier and a password. If the user identification is not validated 106, the user is prompted to re-enter a new user identifier and password at 102. If a valid user identifier is not received, a request will not be considered by the centralized facility.

[0028] After a user identification is validated 104, 108, the user selects a particular software option or application desired to be enabled and further requests access to that option at 110. Selection of the option requires the user to enter data from a graphical user interface (GUI). The GUI prompts the user to input a system identifier identifying the particular device that the user wishes to activate options thereon as well as enter a host identifier that further identifies the physical location of the device. The GUI also provides drop-down menus for the user to select the modality of the device such as a CT scan, MRI scan, PET scan, etc. and a usage period comprising one of indefinite, pay-per-use, limited access, and trial basis. The user additionally selects from another drop-down menu of the GUI the option or application desired to be enabled. Additionally, a field can be created to permit the user to enter an email address or ID for communication with the centralized facility. A field can also be provided to permit customer comments when entering the request.

[0029] After completion of data entry and selections by the user, the request is then transmitted to the centralized facility for further processing. At the centralized facility, a determination is made to decide whether an option key is available 112 for the criteria submitted. Determination of key availability comprises identifying a host identifier, system identifier, selected option, and determining a modality and period of use. The centralized facility can compare and consider the user-entered data with information stored in a database to determine key availability. If the option key is not available 114, for example, if the option is permanently enabled already, then the user is directed to select a new option at 110. On the other hand, if the option key is determined to be available 112, 116, then a determination is made of whether or not the user is qualified 118.

[0030] Whether to grant access to and use of an option in response to a user request is achieved by determining if a set of criteria defining the user's status has been met. Satisfaction of the set of criteria defines a user's status as qualified. Once determination by the central facility that the set of criteria has been satisfied, a user's request is then processed granting access to and use of the inactive option. Alternatively, if the user fails to meet the set of criteria, or fails to maintain on a continual basis a qualified user status, then the user's status is defined as unqualified and access to and use of an option may be terminated.

[0031] The set of criteria may include a number of parameters which preferably are stored in a database in the centralized facility. For example, the set of criteria may require a current account balance or an established line of credit. The set of criteria may also include data such as a valid user identifier, system identifier, software option identifier, host identifier, or use request identifier. In this manner, access to options can be limited to assure user observance of regulatory measures, proper use of new and/or updated options, and compliance with educational training programs and maintenance schedules. Furthermore, access to and use of the option may be denied for delinquent or past due account balances, unavailable credit, a poor credit history, or other accounting concerns.

[0032] To further assist users or customers having a customer status defined as unqualified 120, the user is prompted to contact a customer service representative at the centralized facility 122. After instructing the user to contact the centralized facility at 122, the user then exits at 124 and the method ends 162. After a user has reinstated their user status to qualified, the user may start the process of requesting enablement anew at 100.

[0033] Once the user's status is determined as qualified 118, 126, the activation key or electronic enabler is generated at the centralized facility and transmitted to memory of the device 128. The activation key is preferably an alphanumeric software key or code that is programmed to enable a specific software option on a particular device to prevent the possibility of unauthorized use. A date/time stamp is embedded within the key that provides access to and use of the option upon

installation of the key for the specified time. In other embodiments, upon transmission of the activation key 128, an agreement or license defining the user's rights to access and use the inactive option may be created or alternatively an automatic billing invoice generated and sent to the user.

[0034] After transmission 128, a determination is made whether the transmission of the activation key is successful 130. If transmission is not successful 132, then the system checks whether previous attempts to transmit the activation key have occurred 134. If attempted transmissions of the key have occurred less than N times 136, then the key is re-transmitted at a later time period 126, 128. The value of "N" is completely arbitrary and may be selected by the centralized facility. The value of "N" should permit sufficient leeway to account for transmission error, but also be such that unsuccessful attempts are not compounded with repetitious download failures. Upon the Nth attempted key transmission 134, 138, the user is prompted to contact the centralized facility 122 and leaves the process at 124, 162.

[0035] If a transmission is successful 130, 140 then the activation key is stored in memory of the device and the user is notified of activation key transmission 142. Preferably, the notification occurs by transmission of an electronic notification message from the centralized facility to the user and/or the remote user station.

[0036] After notification of activation key transmission 142, the system then determines whether the device has been initialized or rebooted 144. Determination of device reboot ensures that the device is not in operation, e.g., scanning a subject, while installation of the activation key occurs and thus also permits downloading of the key at any time. Initialization of the device can occur by turning off and restarting the device, a loss of power to the device, manually selecting restart of the device, or any other mechanism that provides for initialization of the operating system of the device. If the device is not rebooted after receipt of the activation key 146, then the user is notified of transmission of the key at 140 and again reminded to install the key by rebooting the device. After rebooting the device 144, 148, the system then determines whether to install the key 150. If the user decides not to install the key 152, then the system again returns to 140

providing another opportunity to install the key once the device is again rebooted. If the user decides to proceed with installation of the key 150, 154, then the activation key is installed 156 for the requested inactive option. The system next verifies installation of the key 158 and notifies the user of installation 160, after which the requesting and installation process ends at 162.

[0037] Further, in an alternate embodiment, after installation of the activation key, the system can be designed to monitor the user or customer status of a user and deactivate the activated option upon a change in the status from qualified to unqualified and/or when a pre-specified time of use expires.

[0038] Accordingly, the present invention includes a method to enable software options that includes receiving a request for activation of an inactive option in memory of a device located remotely from a centralized facility. The receiving station, or centralized facility then determines whether to activate the inactive option in response to the request based on whether a set of criteria, such as a host identifier, a user identifier, a system identifier, usage period, modality, or selected option has been satisfied. If the set of criteria is unsatisfied, then use of the inactive option is denied to the user. If however, the set of criteria is satisfied, then the method generates an activation key configured to permit use of the inactive option upon installation of the key in the device and further sends the activation key from the centralized facility to the device, wherein the activation key is automatically installed upon initialization of the device and enables the inactive option. Preferably, the software to run the inactive option is already installed in the device; however, it is within the realm of the present invention that such software can also be transmitted with the activation key. The activation key is designed to enable the option for a predetermined time period depending upon the usage period selected by the user.

[0039] In accordance with another aspect of the present invention, a system capable of enabling an inactive software application is disclosed, wherein the software application is resident in memory of a device. The system comprises a computerized network and a receiving center connected thereto. A processing

station having a processor is also located within the receiving center. The processor is configured to receive a request from a user for activation of at least one inactive software application resident on the device and generate an electronic enabler configured to activate the inactive software application. The generated electronic enabler is then transmitted by the processors from the receiving center to the device. The device includes a remote processor programmed to control access to the inactive software application and verifies transmission of the electronic enabler. If the electronic enabler is transmitted, the device processor further determines a device operation status as one of active or inactive. If an inactive status is determined, the processor of the device prohibits activation of the at least one inactive software application. If an active status is determined, the device processor enables the inactive software application.

[0040] Accordingly, the invention also includes a computer data signal embodied in a carrier wave and representing a set of instructions which, when executed by at least one processor, causes the at least one processor to review at a centralized facility a request from a user to activate an inactive software application stored in memory of a medical imaging device located remotely from the centralized facility. The processor further determines whether a user is qualified, and if so generates a software script designed to enable the software application. The processor then transmits the software script from the centralized facility to the device such that the software application is enabled only during a reboot of the device. Alternatively, user authorization can be required prior to enablement.

[0041] In accordance with yet another embodiment of the invention, a software enabling system is disclosed comprising a medical imaging device remotely located from a centralized facility and configured to receive transmissions from the centralized facility, wherein the medical imaging device includes a computer having one or more inactive applications resident in memory of the computer. The system further includes a data script creator designed to generate a data script configured to enable a selected inactive application, wherein the data script is further configured to automatically enable the selected inactive application only upon initialization of the device. The centralized facility may include one or more

